

UNIVERSITY OF EDUCATION, WINNEBA

EXPLORING THE EXPOSITORY TECHNIQUES OF TEACHING AND LEARNING
MATHEMATICS IN THE SHAMA DISTRICT



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MATHEMATICS IN THE SHAMA DISTRICT

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DECLARATION

Student's Declaration

I hereby declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

NAME OF STUDENT: JOHN MARSHALL

SIGNATURE.....

DATE.....

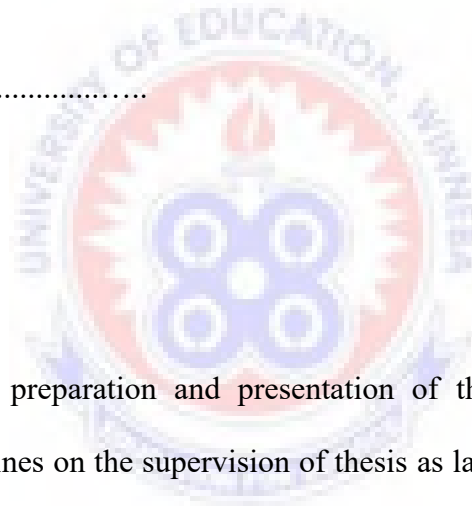
Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines on the supervision of thesis as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: MR. CLEMENT ALI

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DATE.....



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DEDICATION

This project is dedicated to my family: my dear wife, Patience; my children, John, Christabel and Pius, and my friend, Mercy Offei.



TABLE OF CONTENTS

Content	Page
DECLARATION	ii
ACKNOWLEDGEMENTS	iii
DEDICATION	iv
LIST OF TABLES	viii
LIST OF FIGURES	ix
ABSTRACT	x
CHAPTER ONE: INTRODUCTION	1
Overview	1
Background to the Problem	1
Statement of the Problem	2
Purpose of the Study	4
Objectives of the Study	4
Research Questions	4
Significance of the Study	5
Delimitations	5
CHAPTER TWO: LITERATURE REVIEW	6
Overview	6
The Conceptual Frame Work of the Study	6
Description of the subject mathematics	7

The Essence of Mathematics Education	7
Techniques and Methods of Teaching Mathematics	8
Teacher Characteristics in Techniques	12
Classroom Environment in Techniques	14
Teaching and Learning Resources	14
Assessment of Attitudes in Mathematics	16
Teachers' Attitudes towards Mathematics	17
Students Attitudes towards Mathematics	18
CHAPTER THREE: RESEARCH METHODOLOGY	20
Overview	20
Research Design	20
Variables	20
Population	21
Sample and Sampling Technique	21
Instruments of Data Collection	21
Data Collection Procedures	22
Data Analysis Procedures	22
CHAPTER FOUR: RESULT, ANALYSIS AND DISCUSSION	23
Overview	23
Results of General Demographic Information of the Students	23
Results of General Demographic Information of the Teachers	25

Teachers' Attitude towards Mathematics	26
Students' Attitude towards Mathematics	27
Teaching Methods	29
Teaching and Learning Resources	30
Teachers Views about Possible Causes of Students' Performance in Mathematics	32
Discussions	32
CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	37
Overview	37
Summary of the Research Findings	37
Conclusions	38
Implications of the Findings	39
Recommendations	40
Suggestions for Further Study	40
REFERENCES	41
APPENDICES	44

LIST OF TABLES

1: Teacher's Ages and Teaching Experience	25
2: Teachers' Attitude towards Mathematics	26
3: Students' Attitude towards Mathematics	27
4: Students' Views of Mathematics Teachers Teaching Techniques (Positive Approach)	28
5: Students' Views of Mathematics Teachers Teaching Techniques (Negative Approach)	29
6: Methods Used in Teaching Mathematics	30
7: Frequent Use of Teaching and Learning Resources	31
8: Teachers Views about Possible Causes of Students' Performance in Mathematics	32



LIST OF FIGURES

1: Factors contributing to students' performance in mathematics	6
2: Gender of students	24
3: Ages of Students	24
4: Residential Status of Students	25



ABSTRACT

This study explores the factors that advance the expository techniques of teaching and learning in mathematics. The study was conducted in Shama Senior High School in the Shama District of the Western Region of Ghana which had a final-year student population of 726. The descriptive survey research method design was employed, where a simple random sampling technique selected 10 teachers and 280 students for the study. Two expository research models namely, mathematics teacher's questionnaire and final year student's questionnaire were used to collect the data. The Statistical Package for Service Solutions version 20 was used to obtain the descriptive frequencies, percentages, tables, and charts. The observations were discussed in line with the research objectives and questionnaire. The findings found that 70% of the teachers believe that teaching methods and teaching and learning resources are the most important factors that influence students' performance in mathematics and preferred the interactive and expository approaches of teaching. However, the least preferred factors were projectors, computers and manipulatives. It was therefore concluded that expository approaches enhanced and encouraged the use of projectors, computers and manipulatives. It was recommended that the Ministry of Education should harmonize the policy of teaching and learning resources to include projectors, computers and manipulatives for the various expository teaching methods and learning resources.

Key Words: Expository Techniques; Teaching and Learning; Mathematics in Ghana; Shama District



CHAPTER ONE

INTRODUCTION

Overview

This chapter contains the background to the problem, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, delimitation and limitation of the study

Background to the Problem

Mathematics as a subject taught in schools has a huge effect on all aspects of human life. According to Orton and Wain (1994) mathematics is an organised body of knowledge, an abstract system of ideas, a useful tool, and a key to understanding the world, a way of thinking, a deductive system, an intellectual challenge, language, the purest logic possible, an aesthetic experience, and a creation of the human mind

Mathematics, which is one of the oldest fields of study in the history of mankind, has long been one of the most central components of human thought. It has been believed for centuries that mathematics sharpens the human mind, develops their logical thinking; enhances their reasoning ability and spatial power. It influences an individual's personal development and contributes to the wealth of the country. This is mainly because it is at the heart of many successful careers and successful lives.

Mathematical skills for daily life are developed in school mathematics curriculum. Cockcroft (1982) states that there can be no doubt that every child should study mathematics at school. He also highlights that most people regard the study of mathematics, together with that of English as being essential. For this reason mathematics is one of the core subjects in all

schools worldwide as explained by the amount of time devoted to it in schools. In many countries, it is compulsory in primary and secondary levels of education.

A major reason for the persistence of the special place held by mathematics in the school curriculum is the way in which it has been used in the last two centuries as a screening device, or filter, for entry to numerous professions (Howson & Wilson, 1986). Another main reason for studying mathematics is that it is interesting and enjoyable, and that people like its clarity, challenges and intrinsic interest. Cockcroft (1982) states, that the inherent interest of mathematics and the appeal which it can have for many children and adults provide yet another reason for teaching mathematics in schools. In Africa, as in other parts of the world, mathematics enjoys a very prestigious position in school curriculum.

The benefits and importance of mathematics is enormous, however, research and statistics available shows performance of students in mathematics is quite poor. The performance of mathematics is largely influenced by the teaching and learning techniques. In Ghana, the main techniques are lecture, small group discussion, questioning, problem solving, demonstration method and activity methods.

Statement of the Problem

The importance of mathematics in daily life is recognized worldwide and as a result of this, the subject has been given a special place in the school curriculum. Mathematics also plays an important role in scientific and technological development of a nation. The fundamental role of mathematics lies in its day to day applications in most social sciences, business, economics, medicine and management studies. However students' poor performance in

mathematics is globally known and Ghana is not different. Morris and Arora (1992) contend that the problem of students' poor performance in mathematics is not confined to any one country but universal. In response to this global problem, researchers in various countries investigated its root causes. Miheso (2002) carried out a research on the factors affecting mathematics performance among secondary school students in Nairobi Province, Kenya, while Wasiche (2006) conducted a research on the teaching techniques that enhance students' performance in mathematics in selected public secondary schools in Butere-Mumias District in Kenya.

In Ghana, observations and chief examiner's reports of West African Senior Secondary Certificate Examination (WASSCE) results of Senior High Schools revealed that a high percentage of Senior High School students continue to perform poorly in mathematics examinations. For instance, in 2018, only 38% of the students passed in core mathematics. Some individuals have also expressed concerns about the poor performance of students in mathematics. One such instance is Dr. Evelyn Kandakai, the Chairperson of the West African Examination Council (WAEC), who in the Ghanaian Times of March 17, 2016 was quoted expressing concerns about what she describes as "poor performance in Mathematics" by candidates that write the WASSCE in the sub- region. This poor performance is attributed to the techniques, strategies and resources used in teaching mathematics.

This situation is no different among the public Senior High School Students in the Shama District of Western Region of Ghana. Shama District has only one public senior high school and observations and reports shows a persistent poor performance in mathematics over the years. This trend is mainly attributed to poor conceptualization of the expository techniques. Students mainly lack the strategies and techniques to use resources, computers and concrete manipulatives. Studies have been conducted on student's performance in mathematics in

other parts of the country by Benning and Agyei (2016) but no such studies have been conducted to find out factors emanating from the expository techniques of teaching and learning in Shama District hence the impetus for this study.

Purpose of the Study

This study explores the expository techniques of teaching and learning to enhance student's performance in mathematics in the Shama District of Ghana.

Objectives of the Study

The objectives of this study were:

1. To examine factors that influence teachers' and students' attitudes towards the teaching and learning of mathematics in Shama district of Ghana.
2. To examine the techniques and devise models in teaching and learning mathematics in Shama district of Ghana.
3. To examine the extent to which teaching and learning resources contribute to students' performance in mathematics in Shama district of Ghana.

Research Questions

To achieve the objectives of the study, the study sought to answer the following research questions;

1. What factors influence teachers' and students' attitude towards the teaching and learning of mathematics in Shama district?
2. How do techniques and models of teaching contribute to students performance in mathematics in Shama district?

3. To what extent do resources contribute to student's performance in mathematics in Shama district?

Significance of the Study

It is the sincere hope of the researcher that by carrying out this study of the expository techniques and methods contributing to student's performance in mathematics in public senior high schools in Shama District and proffering solutions, the findings and recommendations would be of a great help to all stakeholders especially the District Education Directorate, the school administrators, mathematics teachers, mathematics researchers and professional associations.

It is also the hope of the researcher that other stakeholders who have something to do with the success or failure of the students in schools would be committed to implementing the expository techniques to improve upon students' performance in mathematics in Ghana.

Again, the findings would contribute to knowledge, practices and policies of teaching and learning expository techniques in mathematics and be inculcated into the new education reforms of 2018.

Delimitations

The study used only Shama Senior High school since that is the only public Senior High School in the Shama District. The study was also confined to expository techniques, methods and resources since researchers, teachers and students pay lip service to the aged old techniques. The research sample limited its respondents to only final year students and mathematics teachers in Shama Senior High School.

CHAPTER TWO

LITERATURE REVIEW

Overview

This chapter discusses previous literature relevant to this study. The chapter covers the conceptual framework of the study, description of the subject mathematics, the essence of mathematics, techniques and methods of teaching mathematics, teacher characteristics, mathematics classroom environment, teaching and learning resources and teacher and student attitudes towards mathematics.

The Conceptual Frame Work of the Study

The following variables of the study which are some of the factors that contribute to performance in mathematics would be conceptualized as shown in Figure 1 below.

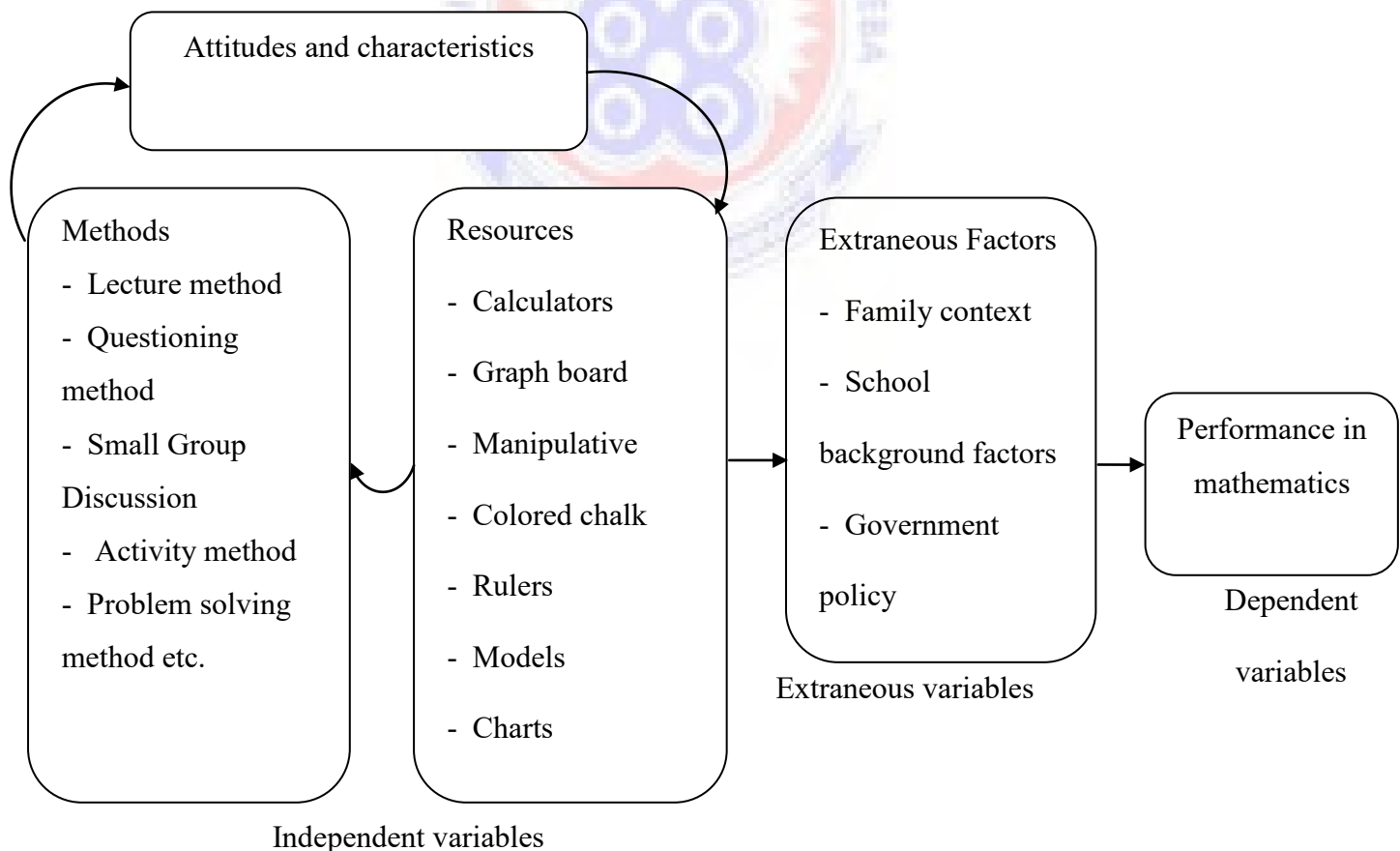


Figure 1: Factors contributing to students' performance in mathematics

Description of the subject mathematics

Mathematics relies on both logic and creativity, and it is pursued both for a variety of practical purposes and for its intrinsic interest. For some people, and not only professional mathematicians, the essence of mathematics lies in its beauty and its intellectual challenge. For others, including many scientists and engineers, the chief value of mathematics is how it applies to their own work. Orton and Wain (1994) attest that mathematics is „an organized body of knowledge, an abstract system of ideas, a useful tool, and a key to understanding the world, a way of thinking, a deductive system, an intellectual challenge, language, the purest logic possible, an aesthetic experience, and a creation of the human mind“. Appiah (2011) states that description of mathematics is environmentally dependent. Some people see mathematics as cultural knowledge which manifests itself in the day to day activities of the people which involve counting, measuring, designing, locating, modelling, and playing in an organised manner. In other cultural settings mathematics is a useful tool, a key to understanding of the world in which we live and something perceived as human creation.

The Essence of Mathematics Education

The main goal of mathematics education is to promote students' learning of mathematics. It focuses on the content and the tools, methods and the approaches that facilitate the teaching/learning activities. This makes mathematics education essentially practical and dynamic, necessitating new changes in teaching the subject. According to Busbridge and Womack (1991), there have been many changes in both the content and the style of mathematics teaching for the last thirty years. They note that modern methods made greater demands for visual and physical aids to help children understand concepts and processes. The old didactic methods of teaching mathematics, which involved rote learning, are gradually being replaced by interactive teaching methods.

On the other hand, the introduction of the use of graphic calculators and computers in mathematics classrooms is another worth mentioning recent change in mathematics. The power of using computers in the teaching of mathematics has been emphasized by the Agenda for Action in the United States as a strategy for developing problem solving skills which was seen as a touchstone for reform (Morris & Arora, 1992). For this reason, the Agenda advised that mathematics education programmes must take full advantage of the power of calculators and computers at all grade levels. Such recommendations have been adopted not only in the United States but also in many other countries. It would be useful to find out the extent to which such recommendations in mathematics education have been implemented in Ghana.

Techniques and Methods of Teaching Mathematics

There are various techniques and methods of teaching mathematics. Every teacher uses his/her specific way of presenting a lesson. That is why many scholars argue that there are as many methods of teaching as there are teachers. On the other hand, there is no one best or most effective method in teaching mathematics. Miheso (2002) notes that no single teaching method can be the method of choice for all occasions. However, much is known about the characteristics of effective methods of teaching mathematics. What is important for every teacher is to select and use the methods with such characteristics. The quality of implementing mathematics programmes is ultimately determined by the teacher's performance and effective work in the classroom situations (Rukangu, 2000). Traditionally, teaching in general and teaching mathematics in particular strongly relied on teachers' exposition followed by practice of the fundamental skills. Many mathematics teachers support the idea that practice makes perfect. They strongly contend that practice or drill alone can help students to master fundamental skills and procedures.

According to Morris and Arore (1992), mathematics teachers at all levels reverted to an emphasis on facts and skills in mathematics (through drill) became very common in many classrooms. It was monkey see, monkey do mathematics, with little or no reason given. Busbridge and Womack (1991) note that teachers explain a rule on the blackboard, give some examples of the rule in operation, and then set the class many more examples and exercises to do for themselves. They also noted that teachers believe that understanding would eventually come through sufficient practice. However, research has shown that drill alone cannot even guarantee recording of the learned theories. Bergeson *et al.*, (2000) contend that drill with a fact or skill does not guarantee immediate recall. They posit that student competence with a mathematical skill does necessitate extensive practice. Drill alone contributes little or nothing to growth in a student's mathematical understanding.

There are a number of principles that appear frequently in any literature on effective mathematics instruction. These include a problem-oriented learning, focusing on meaning, whole-class discussion and small group-work. Effective teaching requires continuing efforts to learn and improve. Many scholars have addressed various issues relating these topics as effective methods of teaching mathematics. Research findings clearly support the use of small groups as part of mathematics instruction. This approach can result in increased student learning as measured by traditional achievement measures, as well as in other important outcomes (Douglass & Kristin, 2000). In a review of 80 research studies on grouping in mathematics classrooms, it was concluded that students working in small groups significantly outscored students working individually in more than 40 percent of the studies (Bergeson *et al.*, 2000). Miheso (2002) argues that most studies on achievement on cooperative learning found that, there was significantly greater achievement in cooperative classes than in the

control classes. Douglass and Kristin (2000) observes that considerable research evidence within mathematics education indicates that using small groups of various types for different classroom tasks has positive effects on student learning. Reviews of studies of the effects of cooperative learning have generally yielded positive findings.

Research (Douglas, 1992) has shown that these programs enhance various effective outcomes, including inter-group relations, acceptance of mainstream academically handicapped students by their classmates, self-esteem, enjoyment of class or subject, and general acceptance of others. Further achievement effects of cooperative learning are generally positive. According to Posamentier and Stepelman (1999), a classroom in which problem solving plays a central role can provide a good environment for mathematics learning to take place. When confronted with an appropriately challenging and interesting problem, students feel both the urge to solve that problem and the concomitant tension that it arouses. A problem needs two attributes if it is to enhance student understanding of mathematics. First, a problem needs the potential to create a learning environment that encourages students to discuss their thinking about the mathematical structures and underlying computational procedures within the problem's solution. Second, a problem needs the potential to lead student investigations into unknown yet important areas in mathematics (Bergeson *et al.*, 2000). Douglass and Kristin (2000) note that investigations have consistently shown that an emphasis on teaching for meaning has positive effects on student learning, including better initial learning, greater retention and an increased likelihood that the ideas will be used in new situations. Similarly, Rachel (2003) found that focusing on the meanings gives students a strong foundation for learning new related ideas. It also helps them to know when to apply particular skills or procedures, because they see the underlying reasons that these methods work. The research findings indicated that achievement levels

were significantly different in interactive from those in traditional classrooms at computational levels.

However, differences in achievement were evident between interactive and traditional classrooms in application and comprehension levels of cognitive growth (Miheso, 2002:83). She also found in her research that currently didactic teaching accounted for 75% of mathematics teaching and only 25% accounted for classroom interaction. On the other hand, research suggests that whole-class discussion can be effective when it is used for sharing and explaining the variety of solutions by which individual students have solved problems. It allows students to see the many ways of examining a situation and the variety of appropriate and acceptable solutions (Douglass & Kristin, 2000). Some mathematics educators believe that for a mathematics teaching method to be effective, it should contain various and balanced pedagogical approaches and activities so that students with different types of learning styles can be catered for. Cockcroft (1982) notes that mathematics teaching at all levels should include opportunities for:

1. Exposition by the teacher;
2. Discussion between teacher and pupils and between pupils themselves;
3. Appropriate practical work;
4. Consolidation and practice of fundamental skills and routines;
5. Investigational work.
6. Problem solving and application of mathematics.

Teacher Characteristics in Techniques

According to *Longman Advanced American Dictionary*, to qualify is to have the right to do something. Thus a qualified mathematics teacher is one who has the right to teach mathematics. Although this right complies with the respective educational policies of each nation, there are two main and common components of the issue. These include the teacher's knowledge of the content, and the possession of appropriate teaching skills. More practically, this can be stated that a qualified secondary school mathematics teacher is one who majored or minored in mathematics.

In general, research according to Alexander and Fuller, (2005) has found that possessing a major or minor in mathematics or science is related to increased student achievement in these subject areas. Students taught by teachers with degrees in mathematics had greater gains in achievement than students taught by teachers with non-mathematics degrees. Few educators, economists, or politicians would argue with the contention that, all other things being equal, highly qualified teachers produce greater student achievement than comparatively less qualified teachers. Indeed, good teachers have distinguishable impacts on student exam scores (Alexander & Fuller, 2005). On the other hand, having a qualified mathematics teacher in the classrooms is a problem almost everywhere.

Despite the fact that research findings strongly emphasize the importance of having qualified mathematics teachers in the classroom, there is an acute shortage of qualified mathematics teachers in most parts of both the developed and the developing countries. According to Bob (2007), in all parts of the world, attracting young or mature entrants into teaching is a major challenge. In Europe, the United States, in South and West Asia and in Sub-Saharan Africa, problems to recruit sufficient teachers still exist. In many countries and regions, recruitment

to specialist subject areas at the secondary phase is particularly problematic (especially in mathematics and science). He also points out that the age profile of the teaching profession is also problematic with large percentages of teachers likely to retire in the coming decade.

Many education systems are supplementing teachers with a growing cadre of para-professionals playing a variety of roles. Teacher recruitment and retention, in particular mathematics teacher recruitment and retention are high on the agenda of education priorities in most countries. South Africa needs to train 20,000 teachers a year if they are to avoid an education crisis. However, research indicates that only 9,000 teachers a year are currently graduating (Adler, Kasima, Mwakapenda, Nyabayaba, & Xolo, 2007:26). They have also pointed out that retention of mathematics teachers has been a problem in Zambia. This has been particularly so with regard to rural schools where many teachers refuse to be posted to avoid enduring the unfavourable working conditions. In Kenya, as in Ghana, education has been regarded as a ladder to economic prosperity and power. Teaching is considered by many as transitional occupation before one is promoted to a position of influence and power. Perceptions are that there is no affluence in remaining a teacher for a long time. This hampers teacher's personal growth in terms of skills and style and so great teachers cannot be developed since young teachers do not stay long enough to develop to great teachers (Adler, *et al.*, 2007). In his research on the causes of high turn-over of teachers in Somalia, Farah (1987) found that 67% of the respondents showed tendency to transfer to better paid economic sectors, such as banks and insurance companies. His study also revealed that teachers are dissatisfied with the salary scales and lack of promotion in teaching services.

Classroom Environment in Techniques

To many people classroom environment is just another expression for classroom setting. It is an undeniable fact that classroom lighting, temperature and ventilation affect students' performance but creating an environment conducive to learning is more than having attractive sights, relaxing sounds, and good ventilation. In addition to that, a classroom environment conducive to learning is a place where everybody feels comfortable and at ease. It is a place where there is mutual respect in a friendly and nonthreatening atmosphere. The teacher is the key factor in influencing the mood of the classroom environment. It is the teacher who creates learner's attitudes towards the subject. With the help of their students, teachers foster positive classroom climate which encourages students to be comfortable and at ease in participating in all kinds of teaching learning activities. The teacher is always the decisive element in the classroom. It is the teacher's knowledge, personality, mood and skills that mould the entire classroom climate. Although most teachers are not aware of it, it is them who mend or end children's ability to learn the subject. I have come to a frightening conclusion: that I am the decisive element in the classroom. It is my personal approach that creates the climate. It is my daily mood that makes the weather. As a teacher, I possess a tremendous power to make a child's life miserable or joyous. I can be a tool of torture or an instrument of inspiration. I can humiliate or humour, hurt or heal. In all situations, it is my response that decides whether a crisis will be escalated or de-escalated and a child humanized or de-humanized, Haim Ginott (www.eqi.org/ginott.htm).

Teaching and Learning Resources

The use of appropriate educational materials is equally important as the use of effective teaching methods when presenting mathematics lessons. To gain optimal results the use of these materials should not be limited to the teacher's

demonstration, but rather students must use them in meaningful ways. Effective instruction depends on both the quality of the resource and the skill of the teacher (Gauther & Lawson, 2004:25). Many studies show that the use of concrete materials can produce meaningful use of notational systems and increase student concept development. According to Douglass and Kristin (2000), in a comprehensive review of activity based learning in mathematics in kindergarten through grade eight, concluded that using manipulative materials produces greater achievement gains than not using them.

They also note that the long-term use of concrete instructional materials by teachers knowledgeable in their use improved student achievement and attitudes. Eshiwawani (1983) points out that the availability of textbooks and achievement have positive correlation. In a more recent meta-analysis of sixty studies (kindergarten through post-secondary) that compared the effects of using concrete materials with the effects of more abstract instruction, suggests that teachers should use manipulative materials in mathematics instruction more regularly in order to give students hands-on experience that helps them construct useful meanings for the mathematical ideas they are learning. Use of the same material to teach multiple ideas over the course of schooling has the advantage of shortening the amount of time it takes to introduce the material and also helps students to see connections between ideas (Douglass & Kristin, 2000). Jones (1970) found that the television instruction in mathematics seems to produce a differential effect on pupils' achievement at different ability levels. A good number of researches assert that the use of appropriate concrete materials in teaching mathematics plays an essential role in enhancing students' performance in the subject.

Assessment of Attitudes in Mathematics

Assessment was once synonymous with examination or test. It was traditionally believed that one final examination or utmost two were enough to assess students' achievements. Recently, both the objectives and the importance of assessment have changed. It is now strongly believed that assessment, teaching and learning are inseparable activities. Orton and Frobisher, (1996) argue that in recent years, the assessment of children's mathematical achievement and attainment has become an increasingly prominent aspect of the mathematics curriculum. They also see that although mathematical assessment and testing of children has always taken place in schools, it has now assumed a greater importance. Although there are sound arguments for the assessment of mathematics being an integral part of what happens in schools and classrooms, teachers and mathematics educators express concern that assessment and testing, in particular, may have an undue influence on the way mathematics is taught and learned.

Cockcroft (1982) advises teachers to form an assessment which is most immediately apparent to a pupil is the marking of written work; this may be routine class work or a more formal test. Such marking needs to be both diagnostic and supportive. A short but influential book by HMI lays out ten principles associated with assessment of pupils' mathematics work. Principle 6 on Diagnostic Assessment starts with the words Teachers need to know what pupils find difficult, and why they find it difficult. Without the latter diagnosis, any action to remove the difficulty will probably be ineffective. The vast majority of teachers would give wholehearted support to the statement but few would be able to claim that they had the knowledge and ability to make it operational in the classroom. Thus eight years on there are few schools which have taken on board the implications of this HMI principle, and pupils continue to make the same mistakes over and over again as little or no diagnosis of their errors is ever made (Orton & Wain, 1994).

Again, Cockcroft (1982) notes in his report that examinations in mathematics that consist only of timed written papers cannot, by their nature, assess ability to undertake practical and investigational work or ability to carry out work of an extended nature. They cannot assess skills of mental computation or ability to discuss mathematics nor, other than in very limited ways, qualities of perseverance and inventiveness. Work and qualities of this kind can only be assessed in the classroom and such assessment needs to be made over an extended period.

Teachers' Attitudes towards Mathematics

It is generally believed that human beings are social persons with beliefs, emotions and views that not only influence but also determine their choices. Teachers' beliefs about mathematics play a major role in shaping their instructional practice, and consequently influence their pupils' attitudes, interests and achievement (Nicolaidou & Philippou, 2003). Mathematics teachers' styles of teaching mathematics mainly depend on their systems of beliefs; in particular on their conceptions of the nature of mathematics, and on their mental models of teaching and learning mathematics. Teachers' attitudes towards the nature of mathematics are likely to affect students' performance in mathematics.

According to Nicolaidou and Philippou (2003), teachers' conceptions of the nature and meaning of mathematics are crucial to teachers' approach to mathematics teaching. Thus, it is seen that the teacher's perception about the nature of mathematics is an integral feature of a mathematics classroom. Basically, there are two main views of mathematics teachers towards the nature of the subject. These are the traditional absolutist view and the non-traditional constructivist view. Teachers with absolutist conception of mathematics describe the mathematics subject as a vast collection of fixed and infallible

concepts and skills. On the other hand, those with the constructivist view see it as a continually expanding field of human creation and invention.

Students Attitudes towards Mathematics

It is most probable that students' attitudes towards mathematics influence the efforts they put in understanding and practising mathematical concepts and skills. This will in turn affect their achievements in the subject. If for example a student believes that mathematics is so hard that only very few students can learn it, and he/she is not one of them, then he/she will not waste time in solving mathematical problems. The implication is also the same if the student believes that it does not have any practical real life applications and hence it is less likely that he/she will succeed in mathematics.

According to Sindhu (1982) a vast majority of people hold mathematics as a dry and difficult subject full of abstract things. Pupils' feelings are important and strongly affect the amount of work, effort put forward and the learning that is acquired. Thus attitudes determine the effort a student is likely to put in his learning of a subject. For example, a student who likes mathematics is likely to put more effort in learning the subject and at the same time increase the chance of performing well in the subject than a student who dislikes the very subject (Benson, 1999). Student's attitudes towards mathematics have been found to be positive in the early years of primary schooling, but decline as they progress to upper classes. It is, therefore, necessary for mathematics teachers to strive and sustain positive attitudes towards mathematics for good performance in the upper classes (Benson, 1999).

In conclusion, teachers' and students' attitudes contribute significantly to the teaching and learning of mathematics. Some of these are mathematics is not difficult by nature, everybody

can learn mathematics and mathematics is essential for daily life. Also, techniques and methods matter a lot in mathematics. The common ones are the interactive approach and the expository approach. Again, teaching and learning resources actually promote performance in mathematics. These include markers, textbooks, computers, projectors, manipulative and the like. Lastly, the literature shows that teachers and students characteristics are influential factors in mathematics performance.



CHAPTER THREE

RESEARCH METHODOLOGY

Overview

The purpose of the study was to explore the expository techniques of teaching and learning in order to enhance student's performance in mathematics in the Shama district of Ghana. In realising this purpose, this chapter has adopted particular research design, variables in the study, study population, the sampling technique and sample size, research instruments, data collection procedures and method of data analysis.

Research Design

The study was conducted using a descriptive survey research method design. This design was adopted to collect data on the factors contributing to students' performance in mathematics in public Senior High Schools in Shama District of Western Region of Ghana. This enabled the researcher to obtain and assess opinions, attitudes and practices of mathematics teachers and final year students. A survey research design according to Gay (1992) can be used to assess personality variables such as attitudes and opinions about events, individuals or procedures.

Variables

The independent variables of this research are teachers' and students' attitude, teaching methods, teaching and learning resources and other characteristics such as teachers views about possible causes of students' performance. The dependent variable is students' performance in mathematics.

Population

The target population for this study consisted of 739 mathematics teachers and final-year students in Shama Senior High school. Due to the scope of this study, the population covered 13 mathematics teachers and 726 final-year students. The final year students were selected because they have treated almost all topics in the mathematics syllabus and were at better position to have experienced the different teaching techniques and methods from different mathematics teachers in order to supply the information from the questionnaire.

Sample and Sampling Technique

Simple random sampling technique was used to select 290 teachers and students representing 39.24% of the population. The sample was made up of 10 teachers and 280 students (20 students from each of the 14 final-year classes). Students were made to pick pieces of papers with 0 and 1 written on them in a box. In each class, there were 20 of the pieces of papers with the 1s hence all who picked 1 were involved in the study. In the case of the teachers, numbers from 1 to 13 written on pieces of papers representing each teacher were put in a box and 10 were randomly picked to obtain the sample for the teachers. This technique was used to avoid biases so as to make valid inferences and generalization on the basis of the observation of variables.

Instruments of Data Collection

Data for this study was collected using questionnaires. Two different questionnaires were constructed, one for mathematics teachers (MTQ) and the other for the final-year students (FYSQ). The purpose of the MTQ (Appendix A) was to find out teachers attitudes towards mathematics, the teaching methods they frequently use and the teaching/learning materials or resources they employ as they teach. Such information was

useful to highlight the relationship between the teacher-related factors and student performance. The purpose of the FYSQ (Appendix B) was to find out students attitudes towards mathematics and students' evaluation of teachers' teaching techniques. This information reflected the relationship between the students' related factors and their performance in mathematics.

Data Collection Procedures

Each selected mathematics teacher was given a questionnaire. The respondents were given adequate explanations before filling the forms. In the administration of the FYSQ, the researcher sought the assistance of other teachers. The teachers assisted the researcher to distribute the questionnaires among the students. Students sampled for the study were gathered in place while filling the questionnaires. After filling the questionnaires, the researcher collected them straight away. This enabled the researcher to obtain all the questionnaires back.

Data Analysis Procedures

The Statistical Package for Service Solutions version 20 was used to obtain the descriptive frequencies, percentages, tables, and charts. The observations were discussed in line with the research objectives and questionnaire.

CHAPTER FOUR

RESULTS, ANALYSIS AND DISCUSSION

Overview

This research explored the techniques of teaching and learning contributing to students' performance in mathematics in the public senior high schools in Shama District of Ghana. The results are presented and discussed in accordance with the research objectives and questions as follows:

1. What factors influence teachers' and students' attitude towards the teaching and learning of mathematics in Ghana?
2. How do techniques and models contribute to student's performance in mathematics in Ghana?
3. To what extent do resources contribute to student's performance in mathematics in Ghana?

Results of General Demographic Information of the Students

Out of 280 students sampled for the study, 38.6% are males and 61.4% females; 41.4%, 57.1% and 1.4% are in the age range of 15 – 17, 18 – 20 and 21 and above respectively; 52.5% of them are day students and 47.5% being boarding students. Most of the students (85.4%) attended JHS in the Western region. The gender, age and residential status of the selected students are summarised and presented in Figure 2, Figure 3 and Figure 4 respectively.

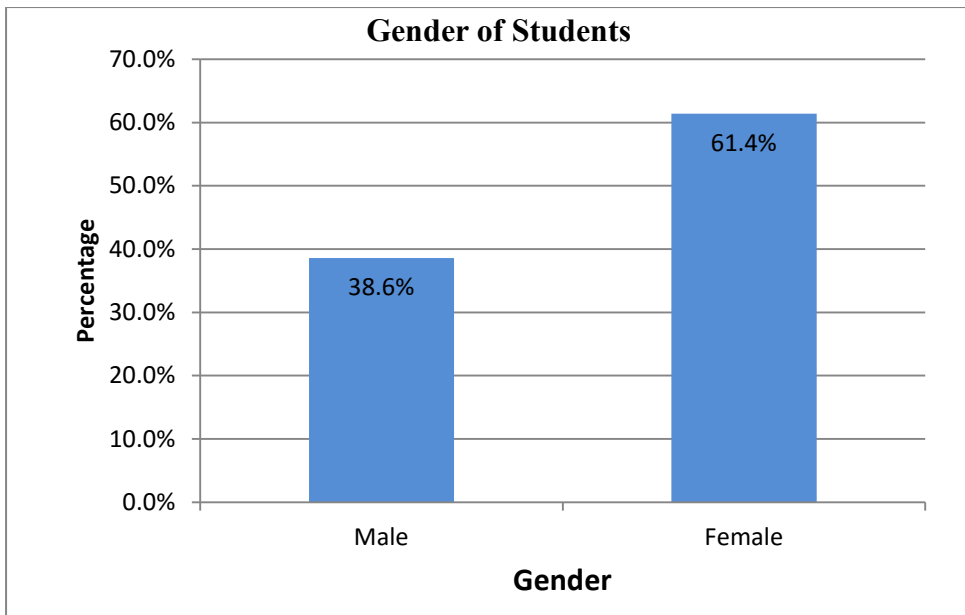


Figure 2: Gender of students

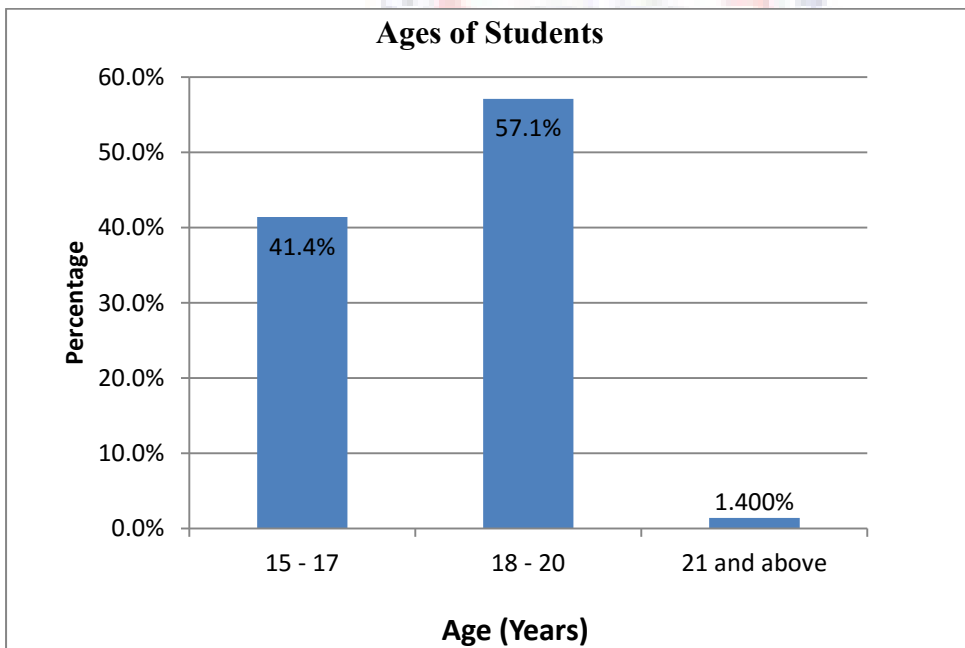


Figure 3: Ages of Students

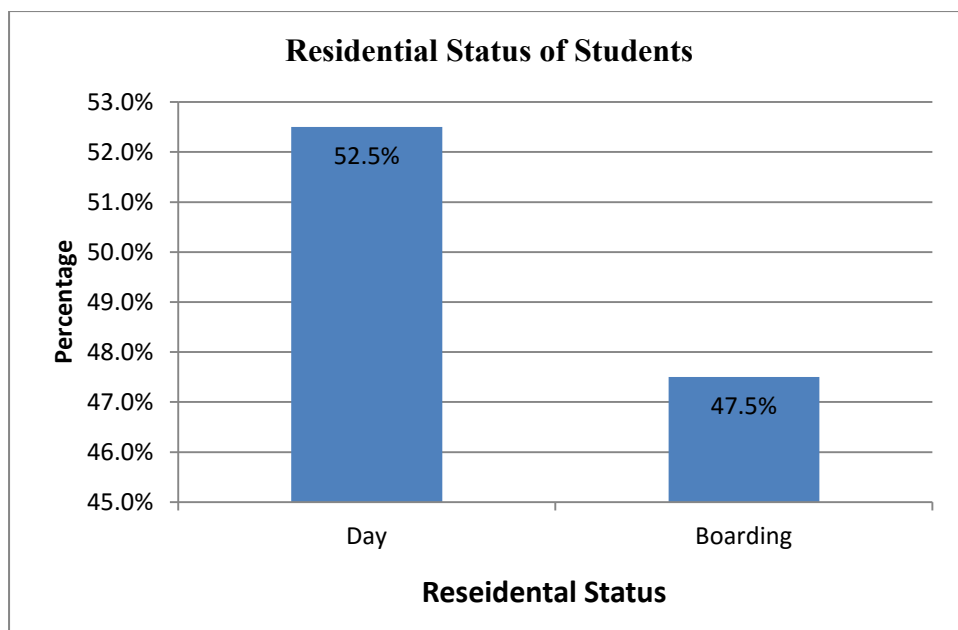


Figure 4: Residential Status of Students

Results of General Demographic Information of the Teachers

All 10 teachers sampled are males. This is because there are no female mathematics teachers in the school. The ages and teaching experiences is shown in Table 4.1

Table 1: Teacher’s Ages and Teaching Experiences

Teacher's Age	Teacher's Teaching Experience (years)		
	Less than 5	Between 5 and 10	More than 10
	%	%	%
Less than 30	0	10	0
Between 30 and 40	20	50	0
More than 40	0	0	20

Data in Table 1 show that 70% of the teachers are within the age range 30 – 40 years with 50% of them having a teaching experience of between 5 and 10 years. This shows relatively young and quite experienced teachers. From the data all the sampled teachers are trained

graduate mathematics teachers with 70% holding B.Ed Mathematics and 30% with B.SC in Mathematics education. This is an indication that the teachers are qualified to teach mathematics at the pre-tertiary level.

Teachers' Attitude towards Mathematics

The teachers sampled for the study were asked about their attitudes towards mathematics. A summary of their responses is presented in Table 2.

Table 2: Teachers' Attitude towards Mathematics

Teacher's Attitude towards mathematics	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	%	%	%	%	%
Mathematics is difficult by nature	30	40	0	30	0
Teaching mathematics does not need resources	60	40	0	0	0
Everybody can learn mathematics	0	0	0	70	30
More practice enhances understanding mathematics concepts	10	0	0	10	80
Mathematics is essential for daily life	10	0	0	30	60
Mathematics is a vast collection of fixed and infallible concepts and skills	10	0	10	70	10
Mathematics is a continually expanding field of human creation and invention	0	0	10	70	20

Data in Table 2 show that majority of the respondents (70%) disagreed to the idea that mathematics is difficult by nature and only 30% of them have such belief. On the other hand, all teachers selected for this study disagreed that teaching mathematics does not need

resources. All of them supported the idea that everybody can learn mathematics. Again, 90% of them agreed to each of the following ideas: more practice enhances understanding mathematics concepts, mathematics is essential for daily life, and that mathematics is a continually expanding field of human creation and invention.

Students' Attitude towards Mathematics

Students selected for this research were asked for their attitudes towards mathematics. Table 3 summarizes their responses.

Table 3: Students' Attitude towards Mathematics

	Strongly agree %	Agree %	Do not know %	Disagree %	Strongly disagree %
I like doing mathematics more than any other subject	6.1	31.4	5.0	41.4	16.1
I hate mathematics	11.4	19.6	9.3	47.1	12.5
Mathematics is a difficult subject by nature	12.1	38.6	7.9	33.2	8.2
Mathematics is useful in life	29.3	57.5	3.6	6.4	3.2
I would not like to do mathematics or any other mathematics related career after SHS	14.3	30.0	6.8	36.1	12.9
Mathematics lessons are boring	12.5	31.8	2.5	39.6	13.6
Mathematics is fascinating because of its intrinsic interest	10.4	50.7	16.4	15.7	6.8

From Table 3, 86.8% of the students believe that mathematics is useful in life; 61.1% believe that mathematics is fascinating. Furthermore; 59.6% of them do not hate mathematics and 53.2% do not believe mathematics lessons are boring. On the other hand, 50.7% believe that

mathematics is difficult by nature while 57.5% disagree that they like doing mathematics more than any other subject.

Students were also asked to assess the mathematics teachers. Their responses are presented in Table 4.

Table 4: Students' Views of Mathematics Teachers' Techniques (Positive Approach)

	Never %	Sometimes %	Often %	Very Often %	Always %
Explains the work well	9.6	48.2	9.6	5.7	26.8
Knows the subject very well	11.8	17.9	14.6	13.2	42.5
Gives homework, marks and returns the next day	18.6	31.1	11.8	6.1	32.5
Arranges to meet students outside class to discuss	42.5	21.8	11.4	5.0	19.3
Encourages students to participate in maths	15.7	19.6	7.9	6.8	50.0
Uses varied methods in teaching maths	15.0	30.4	14.6	10.0	30.0
Gives opportunities to weak students to participate	19.3	25.7	6.8	7.9	40.4

Data in Table 4 indicate that almost all the students (90.3%) claim that their mathematics teachers explain the work well; 88.3% of them perceive that the mathematics teachers know the subject well and more than 80% say that their mathematics teachers sometimes give homework. Furthermore, 85% and 80.8% of them say that teachers use varied methods of teaching and give opportunity to weak students respectively. On the other hand, 42.5% of them say their teachers never arrange to meet students outside class to discuss mathematics problem. The students were also requested to assess mathematics teachers from negative prospective. Table 5 presents a summary of their responses.

Table 5: Students' Views of Mathematics Learning Techniques (Negative Approach)

	Never	Sometimes	Often	Very Often	Always
	%	%	%	%	%
Is very fast	23.9	36.1	9.3	6.1	24.6
Concentrates on bright students only	42.5	16.1	11.1	6.8	23.6
Wastes time in class talking irrelevant issues	47.5	30.7	6.1	4.6	11.1
Responds rudely to students questions	46.8	23.9	6.4	6.1	16.8
Is harsh and moody in class	51.8	30.4	6.1	3.2	8.6
Discourages weak students by ignoring them	60.7	20.4	6.4	2.5	10.0

Data in Table 5 indicate that 76.1% of respondents sometimes see mathematics teachers as being fast at least; 57.6% believe their teachers concentrate on bright students only at least and also 52.5% and 53.2% of respondents supported the ideas that mathematics teachers waste time in class talking irrelevant issues and responds rudely to students questions respectively. On the other hand, 51.8% of the respondents supported the idea that their teachers are never harsh and moody in class. Furthermore, 60.7% of them said that teachers never discourage weak students. It seems that the general assessment of the mathematics teachers by the students was quite positive.

Teaching Methods

The teachers' responses about the teaching methods they used in their mathematics classes are summarized and presented in Table 6.

Table 6: Methods Used in Teaching Mathematics

	Never	Sometimes	Often	Very Often	Always
	%	%	%	%	%
Lecture Method	50	20	10	20	0
Small Group Discussion	10	60	20	10	0
Questioning Method	0	10	30	50	10
Problem Solving Method	0	20	40	30	10
Demonstration Method	0	50	10	20	20
Activity Method	0	40	40	10	10

Data in Table 6 indicate that half of the teachers never used lecture method while the other half used the lecture method sometimes. Also 60% of the teachers sometimes used small group discussion while 30% used the small group discussion at often. Furthermore 70% of the teachers used problem solving method often and 50% used questioning method very often while 10% used this method always. Again 50% sometimes used demonstration method and 20% used this method always. With activity method, 40% of the teachers sometimes used this method; 50% used it often while 10% used the activity method always.

Teaching and Learning Resources

The research tried to find out what materials were used in mathematics classes and how frequent.

The findings are summarized in Table 7.

Table 7: Use of Teaching and Learning Resources

Resources	Most frequent	Very frequent	Frequent	Less frequent	Never
	%	%	%	%	%
Colored chalk	0.0	10.0	0.0	40.0	50.0
Colored markers	40.0	20.0	40.0	0.0	0.0
Text books	0.0	60.0	30.0	10.0	0.0
Diagrams	0.0	50.0	30.0	10.0	10.0
Graph board	0.0	0.0	70.0	20.0	10.0
Models	0.0	0.0	30.0	50.0	20.0
Projectors	0.0	0.0	0.0	0.0	100.0
Calculators	30.0	50.0	20.0	0.0	0.0
Computers	10.0	0.0	20.0	10.0	60.0
Graph sheets	30.0	40.0	20.0	10.0	0.0
Manipulative	0.0	0.0	20.0	20.0	60.0

Data in Table 7 show that 40% of the teachers used coloured chalk less frequently while 50% never used it. Instead 40% used coloured markers most frequently; 20% and 40% used the coloured markers very frequently and frequently respectively. With textbooks, 90% used it at least frequently with 10% using it less frequently. Again, at least 80% of the teachers used diagrams frequently while 10% used it less frequently and 10% never used diagrams. Furthermore, 70% used graph board frequently while 20% used it less frequently and 10% never used it. Also all the teachers used calculators frequently. On the other hand, all the teachers never used projectors; 20% used computers frequently; 10% used it less frequently while more than half (60%) never used computers. Also, 20% frequently used manipulative while 60% never used manipulative.

Teachers Views about Possible Causes of Students' Performance in Mathematics

The selected teachers were also asked about some of the possible causes of students' performance in mathematics. Their responses are summarized in Table 8.

Table 8: Teachers Views about Causes of Students' Performance in Mathematics

	Most important %	Very important %	Important %	Less important %	Least important %
Teachers' qualification	40.0	60.0	0.0	0.0	0.0
Methods used in teaching mathematics	70.0	20.0	0.0	0.0	10.0
Mathematics teachers attitude towards mathematics	50.0	30.0	10.0	0.0	10.0
Resources used in teaching mathematics	70.0	20.0	0.0	10.0	0.0
Students attitudes towards mathematics	50.0	30.0	20.0	0.0	0.0

Data in Table 8 indicate that 70% of the teachers believed that teaching methods and teaching and learning resources are the most important factors that influenced students performance in mathematics. More than half (60%) affirmed that teachers' qualification is the second possible factor. Also, 20% believed that the third possible factor of students' performance in mathematics is students' attitude towards mathematics. The teachers' attitude towards mathematic was the least possible cause of students' performance in mathematics.

Discussions

This research was designed to explore the techniques of teaching and learning that contributes to students' performance in mathematics in the public Senior High Schools in

Shama District of Ghana. This section discusses the findings of the research based on the research questions and objectives.

Teachers' Attitude towards Mathematics

This study sought to find out the attitudes of mathematics teachers in the public Senior High schools in Shama District towards mathematics. It found that majority of the respondents (70%) disagreed to the idea that mathematics is difficult by nature. Only 30% of them have such belief. On the other hand, all teachers selected for this study disagreed that teaching mathematics does not need resources. All of them supported the idea that everybody can learn mathematics. 90% of them agreed to each of the following ideas: more practice enhances understanding mathematics concepts, mathematics is essential for daily life, and that mathematics is a continually expanding field of human creation and invention. These findings are indication that generally the mathematics teachers in Shama Senior High school have positive attitude towards mathematics. Mathematics teachers' beliefs and attitudes towards mathematics play a major role in influencing their student's attitudes and performance in mathematics (Nicolaidou & Philippou, 2003). This could lead to the conclusion that positive attitudes of mathematics teachers in Shama Senior High School are an opportunity in enhancing effective teaching and hence positive performance in mathematics.

Students' Attitude towards Mathematics

This study sought to establish students' attitudes towards mathematics and their views about mathematics teachers' teaching activities. The study found that 86.8% of the students believe that mathematics is useful in life; 61.1% believe that mathematics is fascinating. Furthermore, 59.6% of the students do not hate mathematics and 53.2% do not believe mathematics lessons are boring. On the other hand, 50.7% believe that mathematics is difficult by nature, while 57.5% disagree that they like doing mathematics more than any other subject. In general, it can be deduced from the sampled students' responses that the students have positive attitudes towards mathematics.

Similarly, almost all of the students (90.3%) see that their mathematics teachers explain the work well; 88.3% of the respondents perceive that the mathematics teachers know the subject well. More than 80% say that their mathematics teachers give homework sometimes. Furthermore, 85% and 80.8% of the students say that teachers use varied methods of teaching and give opportunity to weak students respectively. According to Benson (1999), a student who likes mathematics is likely to put more effort in learning the subject and at the same time increase the chance of performing well in the subject than a student who dislikes the very subject. Since students of Shama Senior High School have positive attitude towards mathematics, this could affect positively their performance in mathematics.

Teaching Methods

The study found that half of the teachers never use lecture method while the other half use the lecture method at least sometimes. Also 60% of the sampled teachers use small group discussion sometimes while 30% use the small group discussion at least often. Furthermore 70% of the sampled teachers use problem solving method at least often and 50% used questioning method very often while 10% use this method always. Again 50% used

demonstration method sometimes, with 20% using this method always. With activity method, 40% of the sampled teachers use this method sometimes, 50% at least often while 10% use the activity method always. According to Begerson *et al.* (2000), students working in small groups significantly outscored students working individually. Miheso (2002) also found that interactive learning posted a mean score of 98.2% while expository approaches posted a mean score of 14%. She also noted that teaching approach is a major predictor of students' performance. Therefore, the findings of this study could lead to the assertion that the expository methods used in teaching mathematics in Shama Senior High School by some of the teachers can have a negative effect on students' performance in mathematics while those who use the interactive methods can have a positive effect on student's performance in mathematics.

Teaching and Learning Resources

The study found that 40% of the sampled teachers use coloured chalk less frequently while 50% never use it. Instead 40% use coloured markers most frequently with 20% and 40% using the coloured markers very frequently and frequently respectively. With textbooks, 90% use it at least frequently with 10% using it less frequently. Again, at least 80% of the sampled teachers use diagrams frequently while 10% use it less frequently and 10% never use diagrams. Furthermore, 70% use graph board frequently while 20% use it less frequently and 10% never use it. Also all the sampled teachers use calculators at least frequently. On the other hand, majority of the sampled teachers never use projectors, computers and manipulatives. Douglass and Kristin (2000), hold the view that teachers should use manipulative materials in mathematics instruction more regularly. Hence, these findings can lead to the assertion that the use of teaching and learning resources in mathematics classes in

Shama Senior High could be a factor which contributes to students' performance in mathematics.

Teacher Characteristics

This study also sought to find out the main characteristics of teachers that influence students' performance in mathematics. The study established that all the selected teachers were professionally qualified to teach mathematics with 70% holding B.Ed Mathematics and 30% B.SC in Mathematics education. According to Alexander and Fuller (2005), students taught by teachers with degrees in mathematics had greater gains in achievement than students taught by teachers with non-mathematics degrees. It is therefore believed that this characteristic of teachers in Shama Senior High School could affect students' performance in mathematics positively.



CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

This chapter presents a summary of the research findings after which conclusions, recommendations and suggestions for further research are made.

Summary of the Research Findings

The purpose of this study was to explore the expository techniques of teaching and learning to enhance student's performance in the public senior high schools in Shama District of Ghana. Teachers' and students' attitudes towards mathematics, teaching methods, teaching resources and teacher characteristics were investigated in this study. The following is a summary of the findings based on the research questions of the study:

1. *Teachers Attitudes towards Mathematics*---Most of the teachers had positive attitudes towards mathematics. They believe that mathematics is not difficult by nature and that everybody can learn it.
2. *Students' Attitudes towards Mathematics*---Most of the students had positive attitudes towards mathematics and saw mathematics as useful in life. Again, most of the students perceived mathematics teachers' teaching techniques positively.
3. *Teaching Methods*---Mathematics teachers in Shama Senior High School used varied methods to teach mathematics. The study found that:
 - i. Some teachers used interactive approach of teaching mathematics. This allowed for interaction in the classroom which is seen to give better results.
 - ii. Some teachers also used expository approach of teaching mathematics. This approach limited students' classroom activities to just listening to the teacher

- and copying notes from the board. This minimizes students' holistic understanding of mathematics concepts and hence does not give better results.
- iii. Teachers gave opportunities to weak students to participate in class activities. Teachers do not discourage them by ignoring them.
 - iv. Teachers encouraged students to participate in mathematics lessons.
4. *Teaching and Learning Resources*---Most of the teachers believed that teaching and learning resources is one of the most important factors that influence students' performance in mathematics. However, the teaching and learning resources that could have enhanced students' understanding of mathematical concepts, like projectors, computers and manipulatives were never used.
5. *Teacher Qualification*---All the mathematics teachers who participated in this study were qualified mathematics teachers with B.Ed Mathematics or B.Sc in Mathematics Education.
6. *Other Findings*---All the teachers who participated in the study were males, and were experienced teachers. This was considered as an opportunity that contributed to the improvement of the students' performance in mathematics.

Conclusions

The study found that some teachers used interactive approach of teaching mathematics. This allows for interaction in the classroom and yield better results. On the other hand, some teachers also use expository approach of teaching mathematics. This approach limited students' classroom activities to just listening to the teacher and copying notes from the board. This minimizes students' holistic understanding of mathematics concepts and hence does not give better results.

All the mathematics teachers who participated in this study were qualified mathematics teachers with B.Ed Mathematics or B.Sc in Mathematics Education and are experienced. Most of the teachers believe that teaching and learning resources is one of the most important factors that influence students' performance in mathematics. However, the teaching and learning resources that enhanced students' understanding of mathematical concepts, like projectors, computers and manipulative were never used.

Similarly, most of the students selected for this study had positive attitudes towards mathematics. They saw mathematics as useful in life.

Most of them also perceived mathematics teachers' teaching techniques positively. Since the students did not hate mathematics and the teachers viewed mathematics as being easy to learn, there was the need to address non interactive teaching methods in the classroom and encourage the use of projectors, computers and manipulatives.

Implications of the Findings

The findings in this study are quite essential for improving the techniques of teaching and learning mathematics. In terms of practice, it has contributed on how mathematics teachers stand to benefit from interactive teaching methods in mathematics.

Again, to further enhance policy, it has contributed to how educational policymakers and school managers should make decisions about effective teaching methods and the use of teaching and learning resources in teaching mathematics.

Also, to improve theory, it has contributed to how educational theories, conceptual frameworks and models should enforce effective teaching and learning methods in mathematics.

Recommendations

It was therefore, recommended that:

1. The Ministry of Education and other stakeholders should harmonize the policy of teaching and learning mathematics by:
 - i. Providing teaching and learning resources
 - ii. Organizing in-service trainings for mathematics teachers with regard to teaching methods and use of teaching resources.
 - iii. Revising the curriculum of the teacher training institutions to improve teacher competence in mathematics education.
2. Teachers should experiment and employ best techniques and methods of teaching.
3. Students should learn how to use all learning resources especially projectors, computers and manipulatives

Suggestions for Further Study

The study was confined to Shama Senior High School, the only public Senior High School in Shama District. Further and related studies should be replicated in other Districts of Ghana. This will help stakeholders to grasp overall picture of teaching and learning mathematics. Also, the study was confined to few of the factors that influence students' performance in mathematics. Further and related studies could extend the factors to cover heads of schools, directors, unit heads and related mathematics subjects.

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APPENDICES

Appendix A: Mathematics Teachers' Questionnaire (MTQ)

Student's achievement in mathematics is a serious problem for mathematics educators and mathematics teachers. This study intends to find the factors that contribute to student's performance in mathematics and subsequently make appropriate recommendations.

The information you provide will not be used in any way against you. The results will be treated as highly confidential and are for research purposes only. So you are kindly requested to answer the below questions as honestly as possible.

Section A: General Demographic Information

a) Gender

Male Female

b) Teacher's Academic Qualification

B.Ed Mathematics

B.Sc Mathematics Education

B.Sc Mathematics

Diploma in Education

Others (Specify)

c) Teacher's Professional Qualification

Trained Graduate Mathematics Teacher

Trained Graduate Non-Mathematics Teacher

Untrained Graduate Teacher

Others (Specify)

d) Teacher's Age (years)

Less than 30

Between 30 and 40

More than 40

e) Teacher's Teaching Experience (years)

Less than 5

Between 5 and 10

More than 10

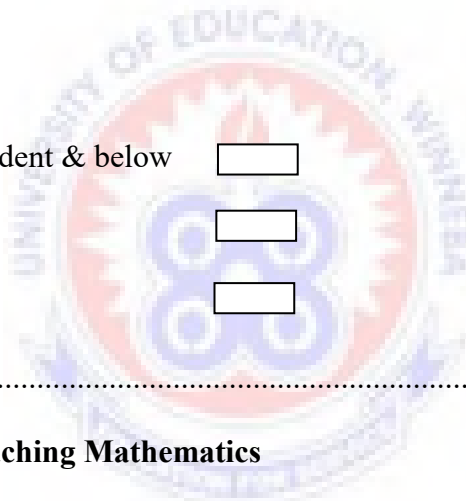
f) Teacher's Rank

Principal Superintendent & below

Assistant Director II

Assistant Director I

Others (Specify)



Section B: Methods of Teaching Mathematics

The following are different methods of teaching mathematics. Show how frequent you use each method by ticking the appropriate box.

No.	Teaching Methods	Never	Sometimes	Often	Very Often	Always
1.	Lecture Method					
2.	Small Group Discussion					
3.	Questioning Method					
4.	Problem Solving Method					
5.	Demonstration Method					
6.	Activity Method					

Section C: Teachers' Attitudes towards Mathematics

Below are some of the different attitudes towards mathematics. Show how strongly you agree or disagree by making a tick in the appropriate box. The rating is as follows:

SA – strongly agree, **A** – agree, **U** – undecided, **D** – disagree, **SD** – strongly disagree.

No.	Attitudes	SA	A	U	D	SD
7.	Mathematics is difficult by nature					
8.	Teaching mathematics does not need resources					
9.	Every body can learn mathematics					
10.	More practice enhances understanding mathematics concepts					
11.	Mathematics is essential for daily life					
12.	Mathematics is a vast collection of fixed and infallible concepts and skills					
13.	Mathematics is a continually expanding field of human creation and invention					

Section D: Teachers' Views about Possible Causes of Students' Performance in Mathematics

Please rate the following factors according to their importance in influencing performance in mathematics such that the most important is rated (1) and the least important is rated (5), by ticking in the appropriate box where **1** – Most Important, **2** – Very Important, **3** – Important, **4** – Less Important, **5** – Least Important

No.	Factors	1	2	3	4	5
14.	Teachers' qualifications					
15.	Methods used in teaching mathematics					
16.	Mathematics teachers attitudes towards mathematics					
17.	Resources used in teaching mathematics					
18.	Students attitudes towards mathematics					

- Any other factor, please specify (1)
- (2)
- (3)

Section E: Teaching Resources

The following are different teaching resources. Show how frequent you use each resource by ticking the appropriate box.



Key: **1** – Most Frequent, **2** – Very Frequent, **3** – Frequent, **4** – Less Frequent, **5** – Never

No.	Teaching Resources	1	2	3	4	5
19.	Colored Chalk					
20.	Colored Markers					
21.	Rulers					
22.	Compasses					
23.	Text Books					
24.	Charts					
25.	Diagrams					
26.	Graph Board					
27.	Models					
28.	Projectors					
29.	Calculators					
30.	Computers					
31.	Graph Sheets					
32.	Manipulative (Abacus, multibase block, geobaord etc)					

Appendix B: Questionnaire to Final Year Students (FYSQ)

The aim of this questionnaire is to establish the students' attitudes towards mathematics and mathematics teachers. The results will be treated as highly confidential and are for research purposes only, so please respond as honestly as possible.

Section A: General Information

(a) Gender

Male

Female

(b) Age (years)

15 – 17

18 – 20

21 and above

(c) Residential Status

Day

Boarding

(d) Programme

General Arts

Home Economics

Visual Arts

Business

Agric

Science



(e) Region of JHS Attended

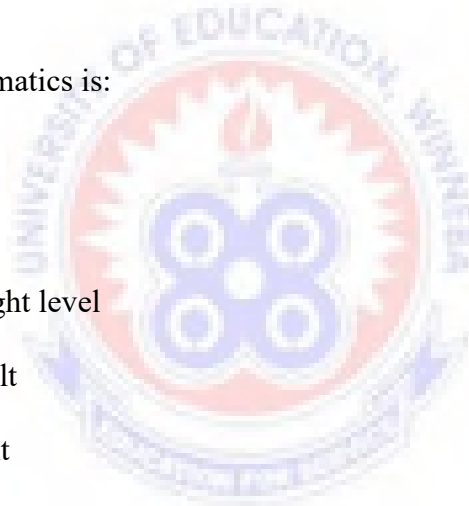
Ashanti	<input type="text"/>	Western	<input type="text"/>
Brong Ahafo	<input type="text"/>	Greater Accra	<input type="text"/>
Upper East	<input type="text"/>	Northern	<input type="text"/>
Central	<input type="text"/>	Upper West	<input type="text"/>
Eastern	<input type="text"/>	Volta	<input type="text"/>

Section B: Student's views about mathematics

Instruction: Circle the letter of the statement that is most appropriate to your personal view about mathematics.

1. The work in mathematics is:

- (a) Too easy
- (b) Fairly easy
- (c) About the right level
- (d) Quite difficult
- (e) Very difficult



2. How well do you understand meanings of new concepts, words and formulae in mathematics?

- (a) Very well
- (b) Quite well
- (c) Fairly well
- (d) Not well
- (e) Not at all

3. How happy are you with your examination results in mathematics?

- (a) Very happy
- (b) Quite happy
- (c) Satisfactorily happy
- (d) Disappointed
- (e) Very disappointed

4. I like doing mathematics more than any other subject

- (a) Strongly agree
- (b) Agree
- (c) Do not know
- (d) Disagree
- (e) Strongly disagree



5. I hate mathematics

- (a) Strongly agree
- (b) Agree
- (c) Do not know
- (d) Disagree
- (e) Strongly disagree

6) Mathematics is a difficult subject by nature:

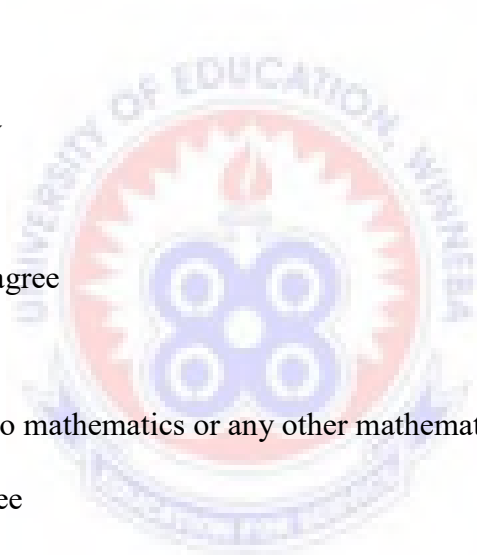
- (a) Strongly agree
- (b) Agree
- (c) Do not know
- (d) Disagree
- (e) Strongly disagree

7. Mathematics is useful in life:

- (a) Strongly agree
- (b) Agree
- (c) Do not know
- (d) Disagree
- (e) Strongly disagree

8. I would not like to do mathematics or any other mathematics related career after SHS

- (a) Strongly agree
- (b) Agree
- (c) Do not know
- (d) Disagree
- (e) Strongly disagree



- 9) Mathematics lessons are boring:
- (a) Strongly agree
 - (b) Agree
 - (c) Do not know
 - (d) Disagree
 - (e) Strongly disagree
10. Mathematics is fascinating because of its intrinsic interest.
- (a) Strongly agree
 - (b) Agree
 - (c) Do not know
 - (d) Disagree
 - (e) Strongly disagree

Section C: Students' Views of Mathematics Teachers Teaching Techniques

Instructions: Put a tick in the space (box) to the right of each view, the rating that corresponds to your view of the mathematics teacher teaching techniques

1 – Never, **2** – Sometimes, **3** – Often, **4** – Very Often, **5** – Always

No.	Views	1	2	3	4	5
11.	Explains the work well					
12.	Repeats where it is not clear					
13.	Answers questions thoroughly					
14.	Is very fast					
15.	Concentrates on bright students only					
16.	Knows the subject very well					
17.	Wastes time in class talking irrelevant issues					
18.	Responds rudely to students' questions					
19.	Is harsh and moody in class					
20.	Gives homework, marks and returns the next day					
21.	Helps students when they are stuck					
22.	Has a sense of humor					
23.	Arranges to meet students outside class to discuss math problems					
24.	Encourages students to participate in mathematics lessons					
25.	Discourages weak students by ignoring them					
26.	Always organized when teaching					
27.	Provides conducive environment to learn					
28.	Attends to students' individual learning needs					
29.	Uses varied methods in teaching mathematics					